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PLACING THE EMPHASIS IN TEACHING THE GEOGRAPHY OF EUROPE.

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EUROPE is entitled to receive in the American school twice as much attention as any other grand division excepting, of course, North America. European energy and intelligence colonized the new world and moulded its institutions. By its naval and military power, by its commerce and manufacturing, by its wealth seeking investment, by the initiative and aggressiveness of its people, Europe has dominated the world's affairs. It is to Europe that our exports largely go; in Europe our people travel; with Europe we have our most intimate relations. Europe manufactures for the world, finances the world's enterprises, and carries the world's commerce.

Europe is made up of many nations with many cities. Its products of farm and factory are almost infinite in their variety. In every one of these countries and cities are things of interest. There is so much that seemingly needs to be taught that the problem becomes largely one of selection—eliminating that which may be omitted, selecting that which *must* be touched upon, underscoring that which demands emphasis.

Looking at Europe as a whole, three facts in its physical geography stand out prominently and challenge attention:

(1) Its remarkably irregular coast line.
(2) Its many and scattered mountain ranges.
(3) Its mild climate, considering its northerly latitude.

COAST LINE: CAUSES AND CONSEQUENCES

Among the geographic influences which have fostered the progress of Europe, it seems undoubtable that its coast line has been of primary importance. Outside of Russia there is no region removed from the sea by

more than 400 miles. In proportion to Europe's area, its coast line is of most unusual extent, probably not less than 40,000 miles. International trade is the great civilizing agency. A nation progresses largely in proportion to its opportunities for gathering ideas from many sources. The nation whose merchantmen visit many ports, or whose people travel and trade widely, gathers from many countries the elements which it compounds into civilization. Europe's land-locked seas and her countless harbors have ever invited commerce. From so many ports it was relatively easy for new ideas to reach all parts of the interior, excepting Russia, and Russia's condition to-day shows the results of that lack of easy access to the sea.

The processes which have been chiefly instrumental in giving to Europe such an irregular coast line are three in number:

(1) The uplifting of scattered mountain ranges, producing many peninsulas.

(2) A subsequent sinking of the coast lands, detaching the British Isles, nearly detaching Norway and Sweden from the mainland, and producing the North Sea, Baltic Sea, English Channel, and other indentations. A similar depressing of the land extended the limits of the Mediterranean Sea, and increased the irregularity of its shore.

(3) The erosive action of glaciers, producing the remarkably fiorded coasts, especially of Norway and Scotland.

No other grand division has experienced so extensively the beneficial effects of coastal depression; and no one can doubt the far-reaching effects of this upon Europe's forward movement in civilization. The second of the physical features which deserve emphasis is

THE MANY AND SCATTERED MOUNTAIN RANGES.

Mountains are Nature's boundary lines, the great barriers to communication. In their very nature they obstruct the free movement of men. A plain promotes free intercourse, the establishment of trade, the exchange of ideas. All this leads to similarity of customs, laws, ideals, and language, and unifies the people. Great plains like those of Siberia, Russia, Brazil, and the United States inevitably lead to nations of large size. On the contrary, the existence of many mountain barriers just as naturally leads to more nations and smaller ones. Truly, Europe has political boundaries that are artificial. Yet the ease with which Russia has absorbed the peoples of the great plain of Eurasia, while the mountain-ribbed parts of the continent remained, during the same period, cut up into many nations, well illustrates the influence of mountain barriers.

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The third fact of large importance is

THE MILD CLIMATE CONSIDERING EUROPE'S NORTHERLY LATITUDE.

It is not uncommon for people to think of Europe as lying in about the same latitude as the United States. They have the idea that London is about due east of New York; that the sunny, vine-clad hills of France are well to the south and that Italy is probably about east of Florida. People are frequently surprised to find that the British Isles are farther north than Newfoundland; that St. Petersburg is opposite the southern point of Greenland; that Norway and Sweden are in the same latitude as Alaska; and that Germany is farther north than Lake Superior; while Florida, instead of being opposite Italy, is really in the latitude of the Sahara Desert of Africa. Venice is very nearly on the parallel of Montreal, and Naples on that of Denver. The ruling peoples of Europe occupy lands in the latitude of Labrador and Hudson Bay. There are three primary reasons for this condition of unusual warmth:

(1) Europe lies athwart the path of the Prevailing Westerlies. The great drift of waters of the north Atlantic is from the southwest. It is a vast reservoir of stored-up heat. Over these mild waters, the Westerlies blow for three thousand miles. When they reach the shores of Europe they have become mild and moist.

(2) There are no high mountains on the western side of Europe to rob the Westerlies of their warmth and moisture as soon as they reach the land; hence their warming influence extends far inland.

(3) There is a high mountain wall extending irregularly across southern Europe, preventing the bleak north winds from invading Mediterranean countries and leaving those countries open to the softening influence of that great warm sea.

Nature has been lavish in bestowing physical advantages upon Europe and Europe has responded with the world's highest type of civilization.

In studying the nations of Europe it becomes evident that each of the countries has a distinct individuality. Each nation has been under the prolonged influence of certain physiographic, historical, or other, influences. Acted upon by these influences, never exactly alike in any two countries, each nation has developed along its own particular lines. Each nation presents some conditions which are characteristic and of world-wide interest. In some countries the industrial activities are of first importance, from a geographical point of view. The United Kingdom, Germany, and Belgium are types of such countries. In others the matters of greatest interest lie in their past history. Such nations are Greece, Italy, and

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Spain. In still others, like Russia, the interest centers around the life and struggles of the people. It seems like a mistake for a teacher always to be drilling her pupils on the productions of a country, or upon its exports and imports, or its manufactures when, as a matter of fact, these are not, in the case of all countries, the important matters.

I shall briefly outline what in my judgment are the kinds of geographical knowledge that may justly claim the emphasis in teaching the geography of the countries of Europe.

THE UNITED KINGDOM

(a) The greatest manufacturing and trading nation of the world.

(b) The greatest colonizing nation of the world.

(c) Along with the growth of her trade and colonies has gone the building of the greatest fleet of merchant vessels that ever sailed under any flag.

(d) Her colonies, scattered all over the earth, and her great fleet of merchant ships, have made necessary the maintenance of a powerful navy. That navy is kept equal to any two other navies in the world.

It is not clear *just* why the United Kingdom has achieved such eminence as a manufacturing, trading, and colonizing nation. The following have been, undoubtedly, factors in bringing about the results: Being insular, her territory has not suffered the military invasions which have so often checked or prostrated industrial development on the continent. Island peoples naturally become seamen and builders of ships. Exceptionally rich deposits of coal and iron situated near together furnished the most important materials needed for building up manufacturing. The limited agricultural resources of the country, coupled with a constantly growing population to be fed, made it necessary to buy food and many of the raw materials of manufacture in other countries; manufacturing the world's wares was the most logical occupation for the English people, circumstanced as they were. Markets must be found or developed. This led to the policy of acquiring colonies, building a great merchant marine and a mighty navy. Another factor in producing Britain's commercial greatness, though a difficult one to measure, has been the genius of her people; their self-governing, their mechanical, and their commercial instincts. It is not possible to say whether physiographic or racial influences have been stronger in the making of the United Kingdom. It is as a type of the industrial and commercial nation that the United Kingdom should be studied.

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GERMANY

While Germany is, like Great Britain, an industrial nation, yet it has achieved greatness through somewhat different channels. In the world's affairs it stands for

(a) Marvelous progress in industry, pushing toward first rank.

(b) Splendid system of schools and universities, and a national devotion to science and general education.

(c) A military system that is regarded the best in the world.

Just as is the case in the United Kingdom, there is a close interrelation among the elements of Germany's greatness. The following facts deserve emphasis:

Central position in Europe, touching nearly all of the other nations. The military training given to all young men; powerful standing army, necessary on account of danger of attack from neighboring countries. The general and technical education of the people, coupled with favorable situation and abundance of iron and coal, promotes industry and leads to commerce. Germany, too, is a typical industrial nation, and should be grouped with the United Kingdom, France, and the United States.

FRANCE

France is almost as impressive on account of what she is not as on account of what she is. For commerce, her situation is the most favorable in Europe. She has coal and iron, good harbors, and intelligent people; moreover, she had a long lead on Great Britain and Germany. Yet, in the struggle for the world's commerce, she has been distanced by them both. France's natural advantages and her opportunities have been superior, but her people have been too unsettled, too unstable, and too much at war, to accomplish the best results in industry and commerce. There are, however, those things in which France leads the world:—

(a) The unequaled artistic taste displayed in all her manufactures.

(b) Paris is the world's most beautiful city and the source of the world's fashions.

(c) In the extent of her vineyards and the amount and beauty of her silk manufactures, France has no equal.

France is a strong naval power, but she is not equal to Great Britain. She has a great army, but it is not equal to Germany's. She has vast manufactures and commerce, but in these she holds only fourth place. When, however, it comes to those employments which call for the finest artistic taste, then France holds undisputed first place.

In teaching the geography of the United Kingdom, Germany, and

France, the emphasis naturally falls on industrial and commercial matters, for those countries stand for industry and commerce in the world's activities.

RUSSIA

Interest in Russia, however, does not center around her industries so much as around her people and her government, her political life, the exile system, and similar topics. The things of most interest and of chief consequence in appreciating the Russia of to-day are, it seems to me, such as these:

(a) Her tremendous size.

(b) The long and almost uninterrupted series of conquests by which her boundaries have been pushed farther and farther outward, until now she controls one-sixth of the land surface of the globe.

(c) The great variety of her people.

(d) The autocratic government; the oppression under which the people live.

(e) Her long struggle to reach the open sea and have ports free from ice all of the year; and her humiliating failures.

Russia's wheat and petroleum are large factors in the commercial world, especially as they come into competition with our own. The Trans-Siberian Railway and the great annual fair at Nijni-Novgorod are worth some attention.

OTHER COUNTRIES

There is little that calls for more than passing notice in Austria-Hungary, Spain, Portugal, Turkey, or the Balkan States. The weakness of the union between Austria and Hungary, the beauty of Vienna, as a city, the manufacturing activity of the German portion of Austria, the salt mines near Cracow, are interesting, but they are not big items in the world's geography as studied in the grammar grades.

Spain's glorious past contrasted with her inglorious present, her mineral wealth, and her remains of Moorish civilization, call for mention, not for emphasis.

Greece, with her splendid history, may properly claim more than passing attention, though pupils of thirteen are not mature enough to understand the importance of that history. Italy, with her ancient and her modern Rome, her Venice, Florence, and Naples, her Vesuvius and Pompeii, is rich in geographical material. The emphasis should fall rather upon the historical than upon the industrial side.

Switzerland means the Alps and their glaciers, travelers, guides, and wonderful scenery. It means the story of William Tell and of the most

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liberty-loving of peoples. It offers the opportunity of pointing out an example of the influence that mountains exert upon the traits of the people who live among them.

The Netherlands means dikes, windmills, canals, proverbial cleanliness, and a commerce and a colonial empire away out of proportion to her small size. The little country is also fitly called "Europe's Dairy Farm."

Belgium is best described as "The Workshop of Europe," a name given on account of her many mills and factories. The abundance of coal and iron has made this manufacturing activity possible.

In teaching Norway, an opportunity is given for laying emphasis on the cause-and-effect relation existing between the people and their physical surroundings. Modern ideals of geography teaching require us to teach as much of rational geography as we reasonably can. It may be overdone, but, as a rule, too little rational geography is taught. There is scarcely any country that better illustrates how people derive their traits and their occupations from the physiography and the climate of their dwelling place than does Norway. The barren lands and the rock-bound coast with its great fiords, made the mediaeval Norwegian a sea-rover, a Viking. The same conditions make his modern descendants the best seamen in the world. Driven to the sea to gain a living, the men of Norway have, perforce, become a race of seamen.

The more important nations of Europe have their distinctive individualities. These countries cannot be properly taught by using the same topical outline for all. In teaching some countries the attention of the class ought to be focused upon productions, manufactures, and trade, but in the case of others the commercial side is distinctly secondary.

I have said nothing about teaching the *location* of places or of natural features. Location is, however, a matter of leading importance in geography and should never be crowded out. The foregoing is not a syllabus, outlining all that the writer thinks ought to be taught about Europe. It is, rather, a sketching of some of the facts which he believes ought to be so emphasized that they will stand out in the memory of the pupil when the bulk of the facts which we taught him have been forgotten.

There are ever present in geography teaching, three dangers:

(1) Teaching too much.

(2) Failure to discriminate between the things which are of primary importance and those which are of only passing importance.

(3) Failure to teach some of those relations between causes and effects which make geography, in some degree, a rational study.

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THE PLACE OF COASTAL PLAINS IN SYSTEMATIC PHYSIOGRAPHY

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THERE is a diversity of practice among authors of textbooks on physiography as to the kind of land form to be first described in the chapters on the Lands. I propose to set forth here the reasons that have led me to give first place to Coastal Plains.

When the description of the lands is taken up, whether it form the first or the fourth of the general headings, globe, atmosphere, ocean, lands, it is well that it should be begun, as the description of the atmosphere or the ocean is begun, with some account of its general features:—the lands are the parts of the earth's crust which rise above sea level; the rocks of which the crust consists are of varied mineral composition; all the rocks are subject to superficial disintegration and decay from the action of the weather; and as a result the land surface is, as a rule, covered with the loose products of its own waste; the waters that fall on the lands gather in streams and wash away some of the waste; thus the land surface is slowly sculptured and, as a rule, the waste is delivered to the sea; there it is spread out in layers on the submarine slopes of the continental mass; hence the lands have come to be characterized by branching river-and-valley systems, worn to such slopes that they mouth at sea level; here the idea of baselevel is introduced. The discovery of stratified deposits of land-waste bearing marine fossils, and now constituting part of a land area, as well as the discovery of the continuation of land valleys under the sea, indicate that the earth's crust is not fixed, but that the relative level of land and sea may change, thus causing the emergence of former sea bottoms or the submergence of former land surfaces. The action of other agencies than weather and streams may be briefly mentioned, such as winds, glaciers, and shore waves and currents. The importance of land waste for the growth of land plants and for the home of many land animals may likewise be concisely set forth in this general chapter introductory to the more systematic study of the lands.

When the general characteristics of the lands are thus set forth, it is necessary to choose some particular class of land form for treatment in the following chapter. The more general features of rivers and valleys have already been presented as general characteristics of the lands in the preceding chapter; the detailed features of rivers, such as falls, lakes, and so on, are so intimately bound up with the detailed history of the land forms

on which they occur that they are, in my judgment, better postponed until they can be taken up in genetic order with or after the forms on which they belong. Glaciers are exceptional features; their early introduction means too long a postponement of many more general matters; besides, the chapter on glaciers should conveniently treat the work of past glaciers as sculpturing agencies after describing the features of present glaciers; and the work of past glaciers is best placed after a somewhat detailed account of land forms of a more normal kind. Shore lines are not appropriately introduced until various land forms have been described; for the initial outline of any shore depends on the shape of the land form which it borders.

Moreover, the first class of land forms to receive particular description should be chosen in accordance with certain important principles, under the lead of which the later chapters also should be arranged. A number of the more general principles having been already set forth in the introductory chapter, those which are now taken as guides should be next in rank of importance. It is, however, evident that different authors must attach different grades of importance to the various principles concerned, according as they adopt one plan or another for the treatment of land forms. Hence it is here necessary to state briefly the essential features of the plan of treatment that I have adopted.

First it is the intention to treat all land forms genetically, and to give them, just as far as possible, an explanatory instead of an empirical description. The reason for this is that no other method of description has been found so effective as the explanatory method in enabling an observer to see what he looks at, to tell what he sees, and to be understood when he tells it. It is well to bear in mind that, as far as geographers are concerned, the value of the explanatory method of description does not lie in its revelation of a neglected chapter of historical geology, namely, the later parts of the history of the lands, but in the clearer appreciation that it gives of the present. Geographers have been too long half-hearted in employing the explanatory method; for while using explanatory descriptions of certain forms, like sand dunes and volcanoes, gorges and sea cliffs, whose origin is evident, they have hardly attempted anything but empirical descriptions of other forms, like mountains or peneplains, whose origin is less apparent. It is full time that the older, empirical method should be replaced by the newer, more comprehensive, rational method. True, even to-day, we do not understand the origin of all forms; but we are now so thoroughly persuaded that all forms of the land have a rational origin that it savors of unwise conservatism to adopt any but a thorough-going rational or

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explanatory plan of treatment for all land forms. If some unexplained forms are encountered in the course of original research, no concealment of the difficulties that they present should be attempted; but it is not advisable on that account to abandon the rational method of study, particularly in an elementary textbook, where the well understood forms will supply all the material that is needed, and where the reasonable processes of land sculpture should be emphasized from the beginning. It would be as well to give up the principle of evolution in the treatment of plants and animals because the phylogeny of some forms is not yet clearly made out, as to let go the principle of genetic explanation in physiography.

The second feature of the plan of treatment is the adoption of the general principle that all land forms are inert masses of earth-crust, made up of certain rock structures, and set in an exposed position by diastrophic forces, there to be worked upon by various sculpturing agencies. Each kind of land form is therefore characterized primarily by its internal structure, and only secondarily by surface forms due to erosion. Under this principle, the unit of classification is the unit of structure, as a plateau of horizontal layers, a mountain range of deformed layers. Mesas and canyons, ridges and valleys, and all the other minor products of the work of eroding agencies on the passive crustal mass, are only subordinate parts or details, just as the bark and leaves are parts of an entire plant.

The third feature of the plan is the recognition of the systematic progress of the work of various eroding agencies in their attack on the inert crustal mass, with the passage of time. Thus inculcated under the scheme of the cycle, the idea of a reasonable and orderly development of land forms is of prime importance in replacing the empirical ideas of an earlier generation. Most persons who are now of late-mature years gained no conception from their school-day study of geography as to the reasons for the course of a river, for the location of a lake, or for the form of a hill. Items of that sort were not then presented as if they were within the reach of rational inquiry. The grown-up school-boys of that time have often expressed to me their surprise on learning that the course of a river can be taught in an explanatory manner, or that there is significance in the occurrence of a lake, or that the form of a hill is full of suggestive meaning; and their surprise has often grown to pleasure when they find that such forms are not only susceptible of explanatory treatment, but that there is a simple genetic sequence under which they can be correlated. That such is the fact is one of the chief merits of the scheme of the cycle and one of the chief warrants for its adoption as a guiding principle in teaching. The scheme once adopted, it is no longer permissible to treat the details of land

form out of their systematic order: A river cannot be arbitrarily called into existence, and a waterfall or a lake placed here or there upon it without due cause: the river must come into existence as a consequent river; new branches may develop as insequents or subsequents; falls may be formed on abrupt slopes of the initial surface, or normally developed as appropriate differences in underground structures are discovered; lakes may be initial features on an uneven surface, or "accidental" features as the result of volcanic or glacial interference with normal processes; and so on through the whole series. When one is fully convinced of the truth and value of the principle of rational treatment under the scheme of the cycle, it is evident that the chapters on land forms must be so arranged that the scheme and its rational treatment, its truth and its value, shall all be duly observed in the text; so that the pupil shall from the beginning be persuaded of the reasonable quality of the subject; and so that he shall have just as little occasion as possible to view the subject from an empirical standpoint. I am so fully convinced of the desirability of all this that it appears to me perfectly allowable to sacrifice certain other points to gain the desired end.

The fourth element of the plan is that it must give adequate preparation for an understanding of the way in which the inhabitants of the earth —plants, animals, and man—occupy the regions in which they live. Inasmuch as land forms constitute an important element of environment, all descriptions of land forms must be so presented that they shall be readily available as a means of vividly picturing the home of organic forms. For this purpose it is essential that the pupil shall acquire definite concepts of various kinds of land forms, so that new examples of similar kinds may be easily apprehended. The small beginning made in this direction by the use of such general terms as coast, volcano, mountain, ridge, valley and so on, must be followed by a more thoroughgoing and systematic treatment, whereby the land forms described shall be clearly brought to mind as constituting one of the most important elements of the environment in which plants, animals and man live.

It is self-evident that the availability of this elaborate plan of treatment will depend largely upon the simplicity of the example in which it is first applied, and upon the careful gradation of the steps by which approach is afterwards made to more and more complicated examples. Hence the first land form to be studied should be one in which the explanatory method is easily used; in which the structures involved are readily understood; in which the scheme of the cycle can be inculcated so gradually and so naturally that the pupil will hardly recognize that he is following a scheme until his attention is called to it at the close of the chapter, where elementary

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induction may build a safe generalization on a sound foundation; and in which the principles thus established are immediately applicable to the more complicated land forms of later chapters.

The coastal plain fulfills all these needs. Its structure is in essence as simple as a crustal structure can be. Even the processes by which the structure was produced are readily grasped by beginners, and are indeed already partly known from a statement in the preliminary chapter concerning the transfer of land waste to the sea, where it is laid down in successive layers on the submarine slopes of the continental mass. The diastrophic process by which the structure is placed in a new attitude is as simple as possible: merely a relative change of level, with the faintest warping, whereby some of the sea-bottom is revealed as a new continental border. The initial form thus offered to the eroding agencies is easily conceived: simply a smooth plain, gently sloping from the old land to the new shore line. The arrangement of the rivers, under whose leadership all the eroding agencies will perform their cycle of work, is easily apprehended: a series of larger rivers, extended forward from their former mouths in the border of the old land, to their new mouths in the new shore line; and a series of smaller rivers which rise on the plain itself: all the rivers following courses consequent on the slope of the plain, and hence appropriately called consequent rivers: all sub-parallel if the plain has a strong smooth slope, but less regular if the plain possessed initial unevennesses. The work that the main rivers perform is readily followed, and the sequential elements thus introduced are apprehended without difficulty in their appropriate relation to the initial form. The work of the branch streams (usually retrogressive insequents) may be naturally introduced, and the valleys that they carve will be understood without trouble.

Complications as to the structure of the coastal plain and as to the progress of the cycle may be introduced with facility. Under complications of structure, the pupil is led to problems of subsequent valleys, of river capture, and of cuestas. Under complications of the cycle, he will meet the effects of renewed elevation or of depression, either of which may occur at any stage in the history of the plain. Actual examples may be presented, matching the theoretical cases; or the theoretical scheme may be built up from the actual cases: both methods are useful, for then the pupil is exercised in deduction as well as in induction.

The most profitable feature of this plan is its disciplinary value. It leads to well-defined concepts, which can be clearly understood by the pupil and stated by him in terms that others can understand. The pupil who follows the plan becomes persuaded that there is a reason for such

things as the direction of rivers, the depth of valleys, the shape of hills; he becomes convinced that every part of the examples he has been studying may be rationally treated; he becomes acquainted with a series of type forms and with the beginnings of a far-reaching systematic nomenclature, in terms of which he can easily write about similar forms when he sees them, or understand what others have written about them. He becomes imbued with the idea that a good description of a land form must include not only such local details as width of valleys and height of hills, but also a broad-minded comparison with a whole series of type forms, and thereby with a good number of related actual forms. He thus gains a sure foundation on which to build larger conceptions of land forms as the home of living forms. He may not at first appreciate the full power of the method with which he has become acquainted, but if he goes farther he will learn that it is only through the careful, rational study of typical forms that he can hope to give adequate verbal account of the innumerable varieties of land forms which the continents possess.

The plan, thus taught in its simplest application, may be carried farther forward to examples of increasing difficulty, of more complicated rock structures, of more frequent crustal movements by which the work of the eroding agencies are interrupted, and of more varied agencies by which the land mass is sculptured. And if the pupil is intelligent, he will see that, however far he may now carry his studies, there is a great progress still to be made by some one, perhaps by him, in bringing within the compass of effective, systematic description, a great variety of forms which no one can adequately describe—or which no one has adequately described—as yet.

The number of classes of structures that should be recognized will, of course, vary with the degree of detail with which it is desired to treat the subject. In an elementary text, very few classes suffice to teach the essential lessons; yet few as they may be, physiographers are not yet agreed upon them; and when it comes to the higher reaches of study, there is nothing like a standard scheme of classification yet adopted. One element, very generally neglected, may be here mentioned: the waste of the land on the way to the sea. It is an intermediary between the inert crustal mass and the active eroding agencies. It is very seldom that the various forms assumed by land waste on its seaward journey are systematically treated. They may well have a chapter to themselves in a more advanced book; they may be distributed under various other chapters in a more elementary book; but in either case they deserve fuller treatment than they ordinarily receive. This is especially true in connection with the extensive deposits of land waste in interior basins, which constitute, as it were, long enduring

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stopping places in the seaward journey of the detritus; and again in connection with the different eroding agencies by which land waste is transported, for besides the normal agency of weather and water-streams there are other agencies of weather and ice-streams, weather and winds, weather and sea waves. The forms assumed by land waste under the action of these different agencies are greatly varied, and while some have long been familiar, others are generally neglected; witness till plains and fluviatile plains.

Satisfactory as this systematic method has proved in many cases, it is not without its disadvantages and difficulties. One of its difficulties to-day is that it seems to be somewhat beyond the desires of certain teachers who would be satisfied with a less systematic—and hence a less disciplinary, less powerful—method of entering upon the subject of land forms. One of its disadvantages is that, as the world is now explored, it is sometimes impossible to find a sufficient series of actual forms with which to confront the theoretical forms; for example, there is no known example to-day of a coastal plain with an incompletely opened inner lowland; that is, of a coastal plain in that particular stage of erosion in which the cuesta is still here and there connected with the old land by "bridges" of weak strata. I have great confidence that this disadvantage will disappear as the world is better explored. Not only so, the examples of coastal plains in Europe are so few and so small that in the opinion of a distinguished European geographer coastal plains would not form a satisfactory subject for first treatment under land forms. We are much better off in the United States as far as possessing coastal plains is concerned, yet the field study that has thus far been given to them has been largely geological, from which it appears that their history is complicated, involving many sequences of deposition, elevation, erosion and depression. As to their physiographic features and their geographic relations, much remains unknown.

Some geographers might say that the systematic method here preferred is at a disadvantage because it is not usually employed in the writings of travelers. It is certainly true that travelers, from whom a large part of our information about the world is derived, do not use a nomenclature based on structure and consistent with the scheme of the cycle—but for that matter, most of them do not use any nomenclature at all, apart from what is retained in a general memory of their school-boy nouns, expanded by a go-as-you-please series of mature adjectives and descriptive phrases, and only too often padded with trivial personal experiences of no enduring value. The insufficience of this random method may be shown by critically examining almost any book of travels or any article in a geo-

graphical journal; it is, as a rule, impossible to make out clearly what the traveler has seen. If a luminous phrase is used by chance, it is almost worse than none, for it only gives a glimpse where one feels sure that a long contemplation would be rewarded. If a significant element of form is mentioned, it is soon counterbalanced by a more abundant mention of irrelevant matters. If a serviceably systematic scheme were actually in use, it might not be worth while to try to supplant it with a new one unless the new scheme were a great improvement on the old one; but as there is no systematic scheme now generally adopted it is certainly desirable to try to introduce one; and this consideration is one of the strongest inducements that I have felt towards developing and elaborating a serviceable, disciplinary method of treating land forms in school books, for thereby at least some of the travelers of the next generation will be better prepared to take advantage of their opportunities, and some of the readers will be better able to understand what the travelers have seen.

No person can understand the geography or history of the United States unless he knows something of the varying features of the Atlantic Coastal Plain, the origin of these features and the influence they have had on the settlement of the Atlantic Seaboard. Tide-water Virginia is a most suggestive title that connotes much of geography and history.

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FLOOD-PLAINS IN THEIR RELATION TO LIFE.

By PHILIP EMERSON
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PHYSICAL geography has been systematized and reduced to a science in recent years. Similar organization of the truths of geography proper, human relations to environment, needs to be effected. Whenever the work of Davis in physiography is paralleled by effectively marshaling the facts and principles as to the life effects of relief and climate, then another great advance in geographical teaching may be expected.

While waiting for such able leadership, members of the Teachers' Geography Club of Boston have undertaken, by means of round-table conferences, to arrange their own conceptions of the causal relations of human life in orderly sequence. The plan adopted is to take the main physiographic features in turn, to briefly review their causal development and such of their characteristics as are most significant in their influence upon life, then to simply set forth the principles or general truths of geography related thereto. As leader of the Round Table, the writer prepared the following theses on flood-plains as a basis for discussion during the meetings of 1905-6. This treatment forms the basis for papers on the most important world flood-plains by members of the club, and for addresses on particular regions by geographical workers. In January Mr. Brown of the Worcester Normal School presented results of his field study on the Mississippi flood-plain and delta, and in February Mr. Huntington gave an account of his field work on the desert plains and waste fans of Central Asia. During 1906-7 the topic Mountains is to be studied.

INTRODUCTORY PROPOSITIONS

1. The peculiar and distinctive field of geography is the relations of man to his environment. Science that disregards this field falls short of being geography. (See JOURNAL OF GEOGRAPHY, Oct., 1905.)

2. Man, like all created life, is the product of his environment, a creature of circumstance. The winners in life's race have taken advantage of environment to advance; man is master of his fate.

3. Aside from the fundamental studies, those that train one to acquire and express thought, geography is most important. Study of the relations of peoples to their environment prepares the individual to take advantage of his own physical and social environment. The comparative study of home geography is the basis for civic improvement. Study of the com-

mercial geography of one's home community in its relation to the world is the foundation for business success.

4. Climate is the most important factor of environment. A favorable climate has been requisite to the evolution of any civilization in the East or West. Unfavorable climates forbid the development of civilized peoples. Climatic barriers separate races. Distinct climatic types produce like customs—occupations, clothing, dwellings—among distant and diverse races. Climatic differences form the oldest and the abiding basis of world commerce.

5. Within climatic limits physiographic forms determine the place, rate, and character of human advance. The abundance and variety of earth resources, which are associated with physiographic types, afford the basis for the multiplication of a people, and the development of their life to a complex civilization. Forms of land and water determine communications, therefore commercial routes and relations, city sites, and that interaction of peoples which is necessary for continuous advancement in civilization.

FLOOD-PLAINS

1. Flood-plains imply a preparatory period of erosion, in their normal development, and they are the result of river deposition. Originating where a stream reached base level, they extend down stream as deltas with their distributaries, and up stream as flood-plains proper with their natural levees and swamps.

2. The significant factors in their influence are (*a*) an ever fertile soil, combined with a sure supply of water, (*b*) free communication along a graded way, (*c*) association with bordering uplands. While these factors are constant, their life effects are radically varied according to the climate with which they are associated.

3. Flood-plains are either naturally clothed with luxuriant vegetation or potentially highly productive, and they normally support dense populations. On broad flood-plains belts of denser population form on the natural levees and beyond the swamps next the upland bluffs. A main center of population develops at the delta head, the focus of highways; others form wherever river meanders adjoin the uplands; and sea ports, likewise, often grow where the delta waterways approach the old coastline.

4. Flood-plains of the sub-tropical, desert belts. Type—Egypt. Civilization originated on the sub-tropical flood-plains of the East. There climate compelled irrigation, while physiographic conditions enabled it and rewarded it richly. Man was obliged to work, then enabled to live

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without work. A tropical sun stimulated plant life, while dry desert winds invigorated human life. Virile nomad conquerors made the flood-plain farmers serfs, the basis of imperial leisure for advance to civilization. Communication within the plain was free, while bordering deserts gave both protection and commercial contact with other fields of life. Whenever government becomes inefficient, the desert returns to the river bank, as in Mesopotamia. Where temperate civilization controls, public works and production surpass those of indigenous races, and the desert recedes.

5. Flood-plains of the equatorial belt of heavy rainfall. Type—the Selvas. Savage life persists in the dense forests with which constant heat and heavy rainfall clothe tropical flood-plains. While both plants and animals live in the tree tops or the waters, the gloomy, pathless forests press man to the river bank. The climate enervates. It makes clothing needless and shelter simple. Fish, flesh, and fruit are as easily taken as it is difficult to maintain clearings for agriculture. There is neither stimulus nor opportunity for advancement. On a wide equatorial flood-plain, river-bank and upland border are dissociated, for a jungle is as impenetrable as the desert is an open roadway. Despite swamps, mosquitoes, and fevers, civilization seeks rubber and other forest products—steams up the rivers, establishes stations, employs natives, maintains clearings—but the forest remains savage.

6. Most temperate flood-plains were originally forest-clad, but have been or may be cleared. Their swamps did not nurture nations, but when mastered by civilization their fertile soils feed and clothe millions. In temperate climes favorable environments are widespread, and industrial life is complex: flood-plain farms there afford the simplest seat of dense populations. These, centered where river ports grow as railway centers, support a varied industrial life and commerce, while water-borne coal, or water-power and mines of the upland border, may further favor manufacturing. If the uplands are pastures, the flood-plain meadows supplement them in the grazing industry. Until the flood-plain swamps are drained, and the upland slopes terraced, the river ports are centers for the lumber trade and its dependent industries.

7. The flood-plains of glaciated regions are often terraced; they are flood-plains that have passed maturity. The Connecticut Valley is typical. The soils of upper terraces are sandy and porous, unfavorable to intensive agriculture. They are never reached by floods, hence afford safe home sites and roadways. The lower terraces possess fine and fertile soils similar to those of growing flood-plains. These soils so contrast with the stony and rather infertile soils of the bordering uplands as to make the

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valley folk relatively prosperous and cultured. While a river bed on a growing flood-plain is perfectly graded, the waterway of a terraced flood-plain is broken by falls into separate reaches. The falls hinder early commercial development, but favor later industrial growth.

8. The alluvial fans and bolson plains of continental interiors are akin to flood-plains. They are graded deposits, whose finer soils and stores of water invite irrigation, and make them seats of relatively dense population engaged in intensive agriculture. Population is densest toward the outer margin of the fan, where the soil is fine and underground water is still available.

9. Interest in man's life leads to study of its conditioning environment. If there are brook or river flood-plains with clearly defined life relations in any school district, the study of this physiographic feature is appropriate to the home geography of fourth grade work. Otherwise it is best investigated when important world flood-plains and deltas are made known.

To know flood-plains and their life effects their own life story should be learned through field study. The flood-plains and deltas of gutters and roadside rills exhibit erosion, transportation and deposition on so small a scale and within so short a time as to be understood by children. Flood-plain meadows and brook deltas in ponds afford homely illustrations on a larger scale.

Some of the world's most important flood-plains and their characteristic life should be seen by students through the stereoscope, or at least studied by means of pictures. Important facts and effects should be emphasized by means of maps, notably the large scale government maps, and wall maps and diagrams prepared at school for class use.

Once the flood-plain type is known to a class, it serves as a basis for effective reviews and for intelligent advance, by means of comparisons.

10. The principles of geography appropriately required in the elementary school are simple and relatively few. But teachers should have a sound understanding and extensive knowledge of geographical relations; and may wisely teach, toward the close of an elementary course, such important causal connections as those just formulated for teachers. Texts and tests should emphasize only the following field of general truths:

Rivers deposit layers of detritus where the current slackens, forming deltas, flood-plains and alluvial fans. Their soil is fine, a mixture of many materials, renewed by every flood, ever moist or easily irrigated, hence fertile and favoring agriculture. Their level surface and slow river current favor transportation. Soil and surface favor production and commerce, therefore dense populations.

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In the rainy tropical belt flood-plains are heavily forested, and are therefore usually sparsely populated by savages. Flood-plains in moist temperate regions, when cleared and drained, and in dry desert regions, when irrigated, support dense populations of civilized peoples.

The flood-plains and deltas of China, India, Indo-China, Mesopotamia, and Egypt, and those of the Rhine, Po, Amazon and Mississippi should be known as such and compared, affording a basis for the generalizations stated above.

While the above paragraphs are too condensed in style for easy reading, they serve well as the basis for exposition and for discussion by a round-table conference, and here they may excite thought if they do not altogether satisfy inquiries.

Certain of the great flood-plains of the world are the most densely inhabited districts known outside of selected small areas in some of our chief cities. The ease with which the necessities of life have been secured on certain of the flood-plains of temperate and subtropical Eurasia has made these areas the cradles of great nations and has enabled them to sustain a dense population from time immemorial. As is the case with all land forms, climate has a greater influence in determining the success of occupation than have the inherent features of the form itself. The Mackenzie has a great flood-plain with fine soil, abundant water and easy slopes but it is situated in an inhospitable climate and is not to be compared with the plain of the Mississippi, which is naturally no more fertile, but which has the advantage of a favorable location climatically. The same thing holds true of the great plains of northern Eurasia and to a certain extent is true of the tropical plains of the Congo and Amazon.

The more intimately we study the relations between peoples and their environments the more clearly we see how powerful an influence is climate. Broadly or narrowly considered climate is the great geographic determinant that influences man as to his occupations, manner of life, food, clothing, form of shelter, temperament, character of government to a certain extent and form of laws.

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MATHEMATICAL GEOGRAPHY.

By WALTER S. McGEE
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THIS article aims to present a method of study, together with those more important truths which every teacher of geography should have clearly in mind. It is written primarily for those teachers who have found difficulty with mathematical geography. As an aid to the comprehension of actual conditions the following hypothetical cases are proposed for detailed study. Throughout this paper the earth is regarded as a perfect sphere and the sun's rays as parallel. To represent the earth place a spherical object—*not a mounted school globe*—at one side of the room and for the sun use a lamp placed at the center of the room.

CASE I. *The earth stationary and motionless.* With lamp and sphere placed as above suggested and in use at every step the following facts should be verified:

1. One-half of the earth is lighted and one-half is dark.

2. These two halves are separated by a great circle of the earth called the circle of illumination (C. I.).

3. The sun's rays are vertical at only one point, the point of vertical ray (P. V. R.). This P. V. R. is at the center of the lighted hemisphere and the C. I. is everywhere 90° from the P. V. R.

4. The sun's rays are tangent to the earth's surface at all points on the C. I.

5. To an observer at the P. V. R. the sun is in the zenith. Its altitude is 90°.

6. To all observers on the C. I. the sun is on the horizon. Its altitude is 0°.

7. To any observer starting from the C. I. and traveling to the P. V. R. the sun will appear to rise as he approaches the P. V. R. and to reach his zenith as he reaches the P. V. R.

8. The altitude of the sun can always be found by using the formula Alt. = 90° — D, in which D is the observer's distance from the P. V. R. (Suggestion.—Find altitude of the sun for points 5°, 10°, 30°, 45°, 90° and x° from P. V. R., using above formula and illustrating each problem by a drawing showing earth, parallel rays of sun, and observer with outstretched arm pointing toward the sun.)

9. The intensity of the sun's heat will be greatest at the P. V. R. and will diminish as the distance from the P. V. R. increases.

10. The presence of the earth's atmosphere enables the sun to send

a part of its light some 18° beyond the C. I. This partially lighted belt or twilight zone lies between the C. I. and the region of complete darkness. Its light comes mostly by reflection from the clouds and dust particles of the atmosphere.

11. With such a stationary, motionless earth there would be neither sunrise nor sunset, seasons nor zones, axis nor poles, parallels nor meridians.

CASE II. *The earth stationary and rotating on an axis pointing directly toward the sun.*

1. Rotation does not cause day and night.

2. The P. V. R. remains stationary at one of the poles and the equator coincides with the C. I.

3. Rotation does not cause, for any point, any change in altitude of sun or in position of the sun in sky.

4. Rotation gives rise to axis, poles, equator and parallels, but not to zones, tropics or polar circles.

CASE III. *The earth stationary and rotating on an axis at right angles to the direction of sun's rays.*

1. Rotation causes day and night for all points except the poles.

2. The P. V. R. is always on the equator, the C. I. passing through the poles.

3. The C. I. cuts all parallels into two equal parts making day and night everywhere equal.

4. Since length of day and position of sun's daily path in the sky remain the same from day to day, there can be no seasons, neither can there be zones, as the term is properly used.

5. To observers at the poles the sun will be on the horizon, neither rising nor setting, but making one complete circuit for each rotation of the earth.

6. For all points within 18° of either pole the twilight will last 12 hours, there being no period of complete darkness. Although the twilight belt is of uniform width the *time* required for a given point to cross the belt is not everywhere the same. It is shortest at the equator where the rate of rotation in miles per hour is greatest and increases with latitude. (Suggestion: Make a collar of coarse wire netting or of some transparent material wide enough to cover the twilight zone. Hold it stationary in proper place and verify the above statements as the globe is rotated within the collar.)

CASE IV. *The earth revolving around the sun in a circular orbit and rotating on an axis perpendicular to the plane of the orbit.*

Resulting conditions are as described for Case III. The P. V. R.

remains on the equator, days and nights are equal and there are neither seasons nor zones. *Revolution alone does not cause seasons and the earth's surface is not marked off into its five zones on the basis of temperature.*

Turning now from the consideration of these supposed cases let us study existing conditions. Place a lamp at the center of the room and a school globe at the east side of the room. Adjust the globe so that the C. I. passes through the poles, the axis pointing to the north of the vertical position. The globe so placed represents the earth at the time of the autumnal equinox, about September 22. The P. V. R. is on the equator; the C. I. passes through both poles and cuts all parallels into two equal parts, making for all the earth except the poles, 12 hours day and 12 hours night. To observers at the poles the sun is on the horizon all day, as given for Case III., 5. The condition of twilight are as described in Case III., 6.

Advance the globe northward in its orbit and notice that the P. V. R. immediately leaves the equator, shifting southward as the earth advances. Also there immediately appears about the north pole a small circular area which remains in darkness during the entire time of each rotation and about the south pole a similar area which has continuous sunlight for the entire time of each rotation. As the earth advances in its orbit these polar areas, having neither sunrise nor sunset, increase in size; the days in the northern hemisphere grow shorter and those of the southern hemisphere grow longer. As the earth reaches the position of the winter solstice, about December 21, the P. V. R. reaches its most southerly position, latitude $23\frac{1}{2}^\circ$ south, and the polar areas above described reach their maximum dimensions, $23\frac{1}{2}^\circ$ in radius. The P. V. R. has moved through $23\frac{1}{2}^\circ$ of latitude in about 90 days, or nearly 1° in four days, and the C. I. has moved $23\frac{1}{2}^\circ$ from its September position.

Take a position quite near the lamp and with the globe placed for the December position at the north side of the room note the following points: (*a*) The S. Tem. Zone appears much wider than the N. Tem. Zone. (*b*) The N. Frigid Zone is entirely hidden from view while the S. Frigid Zone is entirely visible. (*c*) The C. I. lies tangent to the polar circles. (*d*) In the northern part of the N. Tem. Zone the days are very short becoming 0 hours at the Artic Circle. (*e*) In the S. Tem. Zone the days are long, being 24 hours at the Antarctic Circle.

With the globe at the west side of the room in the proper position for the vernal equinox it is seen that the P. V. R. is again on the equator, the days and nights are again equal and other conditions are as given for March 21.

Place the globe at the south side of the room to represent conditions

at the time of the summer solstice about June 21. The P. V. R. is now 23½° north of the equator. The C. I. is again tangent to the polar circles. The N. Frigid Zone is now wholly in the light and the S. Frigid Zone is wholly in darkness. The northern hemisphere is now turned toward the sun. It has its longest days and the sun's rays are now most direct, summer coming as a result of these two facts. In the southern hemisphere conditions are just the reverse, producing winter.

Carry the globe through the last quadrant of its orbit noting the shifting of the P. V. R. and of the C. I., the change in length of day and night and the change in altitude for the sun for various points.

Take a position in the center of the room and as the globe is carried around the room by an assistant try to *see* that the following general statements are true:

(1) The P. V. R. travels in one year twice across an equatorial belt 47° wide.

(2) The Torrid Zone is that area which receives, at some time in the year, the vertical rays of the sun.

(3) The N. Frigid Zone may be defined as that area about the north pole which at one time in the year has 24 hours of continuous darkness and six months later 24 hours of continuous sunlight. The S. Frigid Zone may be defined in the same manner.

4. The temperate zones are those areas which have in every 24 hours a sunrise and a sunset but which never receive the vertical rays of the sun.

(5) The poles are the only points having six months day and six months night.

(6) Points 1° from the poles lack about 8 days of having six months day; points 2° from the poles lack 16 days; 3°, 24 days x°, 8x days if the point is still within the polar circles.

(7) At the equator day and night are *always* equal because the C. I. always bisects the equator, both being great circles of a sphere.

(8) The difference in length of day and night is greatest when the C. I. is farthest from the poles, as the parallels are then cut most unequally by the C. I.

(9) The maximum difference in length of day and night varies from zero hours at the equator to 24 hours at the polar circles.

A FIELD STUDY OF LAVA FLOW.

By GEO. A. BARKER
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ONE of the branches of physiography, which seems destined to remain a text-book subject for most students, is vulcanism. While there are many portions of our country where igneous rocks are found, most of the phenomena of volcanoes in the making are absent. We can never hope to study vulcanism as we study erosion to seize upon the force in action. To most of us, vulcanism must always remain in the realm of geology rather than physiography. We can hardly hope to bring it home to the pupil.

It occurred to us, when going over this part of physiography, that, as we were near a great steel mill, something might be learned of lava phenomena, especially lava flow, from the molten refuse, or slag of the mill. An investigation into conditions showed they exceeded our fondest expectations. This molten slag is poured down a slope at the foot of which is an abandoned stone quarry now filled with water.

The class was taken to the place where the molten slag, or lava, as we may call it, is poured down the slope. Fig. 1 shows very well the general surroundings. In the foreground some cooled flows can be seen. A study of the molten flow was taken up. The change in color of the lava as it was poured down the slope was noted, as well as the change in velocity of flow as the material commenced to cool. Some stones dropped into the molten flow demonstrated its density as they moved along with it.

After the slag had been on the slope several minutes, a study was made to find whether it was molten still, and, if not all molten, what part had cooled. Several stones were thrown on it and they sank through the crust displaying the glowing interior. The broken up appearance, due to flowage underneath, after the surface had cooled to rigidity, duplicated in miniature the surface of natural flows which are thick and slow-moving. Several flows with such roughened surfaces are shown in Fig. 1.

To distinguish between the different flows was the next question. Here no difficulty was found. First, the flows differed in color, scarcely two being of the same color. In the second place, they differed in texture all the way from the very liquid, ropy flow shown in the foreground of Fig. 1 to the dark-colored rough mass to the left of it.

Where the lava flowed into the water an interesting study was made. As soon as the flow strikes the water, a cloud of steam almost obscures it, but beneath the steam it may be seen boiling up from the water it has

suddenly vaporized. A kind of pumice of a very cindery, fragile nature is made as the lava strikes the water. But more lava runs down the slope and is changed to pumice until a sort of cindery platform is formed. Higher and higher it is built by the boiling up of the lava, combined with its explosion and expulsion several feet into the air in a molten state. Fig. 2 shows a closer study of one of these cones. In the background and to the right and

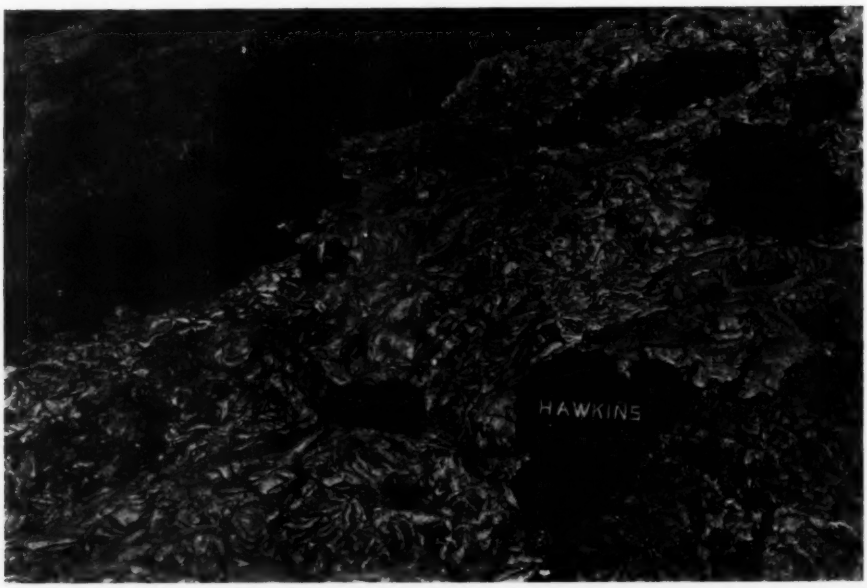

FIG. 1.

Ropy Flow in Foreground. Cindery Flow in Background.

left can be seen the cindery pumice platform which was built before the crater was formed. The hardened material on the right of the cone was the molten material thrown into the air to drop on to the side of the cone.

A very interesting case of chemical metamorphism was noted. In one place the lava runs over a ledge of Niagara limestone calcining the stone on its upper surface.

After the study of lava flow and cinder cone is completed, a collection is made of the various artificial lavas which duplicate, in a sense, the natural lavas. It is unfortunate that most of these artificial lavas are not

produced in the flow itself. They are part of the cooled crust on the inside of the ladles which crust is forced out after the ladle is emptied. One of the most interesting of these rocks is a kind of scoria which forms the bulk of this crust. It is honeycombed with cells, so much so, indeed, that it floats for some time if thrown on the water. If some of the cells are

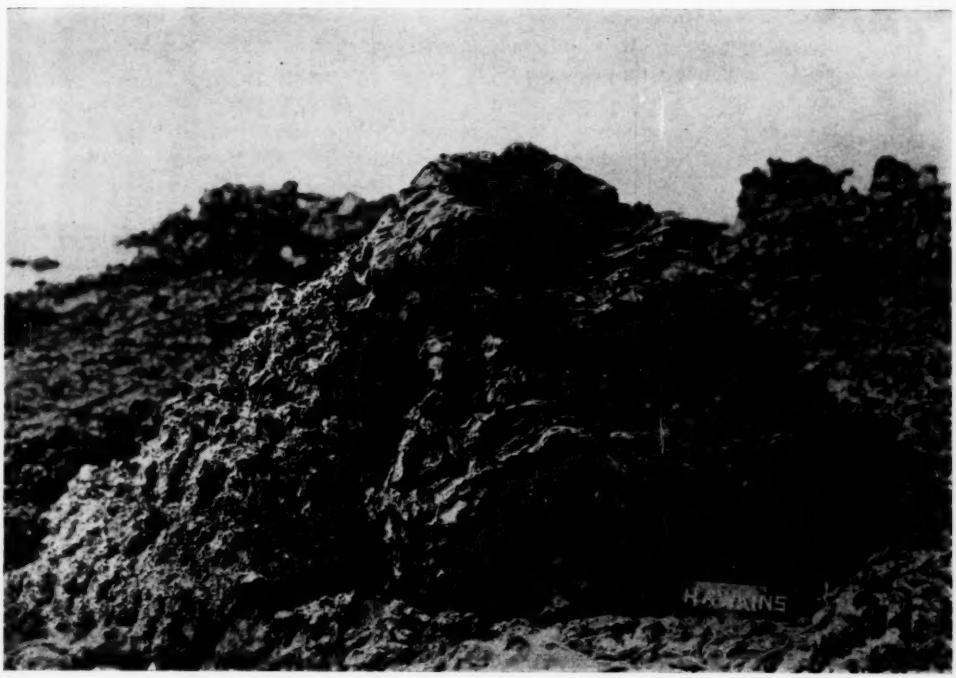

FIG. 2.

Completed Cinder Cone. Water in the Background.

broken open a slight odor of hydrogen sulphide is noted. This is probably the gas which made the bubbles. The lava flow usually has very small bubbles near its surface and below the surface shows very well the distortion of the pores or cells due to flowage after they were made. Against the ladle on the inside a sort of obsidian, dark brown and semi-transparent, is formed. We have already spoken of the pumice cinders where the lava flows into the water.

After the whole study has been made a recitation is held on the spot and the distinctions between this flow and the lava flow of volcanoes are pointed out. Other phenomena of volcanoes not represented here are brought out by questioning the pupils who have already had the text-book on this subject.

I do not want to say that such a study of lava flow may not arouse some misconceptions in the pupil's mind, but I know that the pupils are several steps nearer to a real knowledge of vulcanism than the text-book would have taken them.

EDITORIAL

WORDS VERSUS THINGS IN GEOGRAPHY TEACHING.

GEOGRAPHY teaching unfortunately still continues in many schools to be a study of words with little attempt to make the work real or meaningful to the pupils. In spite of all the recent emphasis of home geography, for instance, many teachers have not yet found that the central thought of home geography is the study of the relations between the pupils and their own environment; they teach words from a text-book and not things; they study home geography as if it were concerned with Central Asia or the antipodes, and do not found it on the home locality as they should. Beginners in geography need to study things, and then to read about them in words, but the memorizing of sentences or paragraphs blindly is as valuable as the learning of the Greek alphabet, and no more so. Many children study about rivers, lakes, divides, transportation, trade, etc., with no conception that these are to be seen in their own locality, or that they in their daily lives cannot help but be affected by these or other simple geographical factors. In the study of many portions of school geography the impressions must and should be first presented through the printed word; but not so the elements of geography, with which all later phases of the subject must be compared and through which interpreted. The memorizing of words or sentences is not necessarily the absorption of ideas. Pupils may and do study and memorize words and indeed whole sentences, as the typewritist reads sentences with no conception of their meaning; they may indeed be able glibly to write the words of the text, but they may have no knowledge of what it is all about.

Geography deals with things, and these things must be described through words. The author of the text or the supplementary reader can only describe the things of which he would speak to his readers through the printed word. Unless the pupil can go beyond the words and gain more than a glimpse of the wholes described in the sentences or paragraphs, he has gained no knowledge and perhaps not even any information. Pupils should not be expected or allowed to express the ideas they have gained by quoting the sentences they have read. They should be made to tell, informally and in their own words, the result they have gained. If they can do this they probably know what they have studied about, and have gained some knowledge. The quoting of words may mean nothing more than the reading of a sentence visualized for the moment and then to be lost.

Geography for generations has been very largely, to many children, merely a task of arranging words in a recitation as they were arranged in a text. To many pupils geography is nothing more now. Yet geography deals with very vital, very personal and very obvious facts, so personal as to affect the children daily and so obvious that it would seem as if a teacher must be wilfully blind who did not see the geography about her and most obstinate if she did not make use of it. It is time that all teachers subordinated the teaching of words to the teaching of things in which task words are used as a means to an end. Geography is real, it deals with the relations of living things to a no less living earth, and it should be so taught that pupils realize the value of a knowledge of geography and learn how to make use of school geography out of school. Let us get back of the words to the facts, and make those facts alive and personal to every child.

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NOTES

A School Excursion in Australia. In the geography course at the Continuation School, a series of field lessons is included as the most important section of the work.

The pupils see things for themselves, and discover a meaning in the features and objects lying about them. They delight in this original investigation and although these excursions are voluntary, there is always a very large attendance.

For successful nature-study or geography work, the first requisite is to let a pupil see that there is something worth looking at, and worth thinking about, in his own country, and in his own surroundings. Then he will look and see for himself. This excursion was undertaken to enable the pupils to stand on classic ground, to wander where scientific leaders have worked. For the future, they cannot think of their intensely interesting country as being unworthy of study, and as containing nothing worth seeing.

Of course, if it became necessary to travel to the Werribee Gorge, and such distant places, to see something to interest us, nature-study would quite fail. We find abundance of good material in our school surroundings. An excursion such as this only deepens the desire to further examine our own district by letting the pupils see that their own land has something worthy of investigation by even the greatest scientists.

Before visiting this famous wonderland of the Werribee Gorge, fortnightly excursions had been taken nearer home. Sedimentary rocks had been studied on many outings, and their mode of formation determined. Evidence of a cooling, wrinkling earth had been obtained from the foldings of the older sedimentary rocks seen in the various cuttings and creek sections about Melbourne. Lava had been examined in quarries and creek cliffs; and river work at various stages studied on the Yarra, Saltwater, and on several creeks not far from the school, as well as in the school yard after heavy rain. Canyons had been seen in the making at Coburg, East Kew, and other places; coast features and the sand drift, together with the formation of sand dunes noted at Port Melbourne; marine erosion at Beaumaris; coastal plains, old plains, young plains, flood plains, river terraces, lakes, and meanders, observed, so that geography has become a living subject closely related to the lives of the children —a subject in which knowledge is gained at first hand by the pupils themselves.

During the study of Victoria, the most important of all countries for us, many references were made to Bacchus Marsh, scientifically the most famous spot in Victoria or, indeed, in Australia. Many inquiries were made by the pupils as to why an excursion was not undertaken to give them the oportunity to see for themselves a famous place. Financial reasons and the difficulty of getting to the exact locality (five miles from Bacchus Marsh) without loss of time put it out of the question. However, this year the increase of the number of pupils to 400 rendered the chartering of a special train possible. The persuasive powers of the Principal, Mr. Hocking, secured permission from the Railway Department to detrain at the desired spot, so it was decided to leave the matter to the pupils. Not one in the school objected to paying half-a-crown for a geography lesson in the Werribee Gorge. Splendid autumn rains had clothed that beautiful district with green, and everything was favorable for a good field lesson.

It was intended to be an ordinary school excursion, the only difference being that the whole 400 pupils were to go, instead of the usual 200 taken at one time—the junior pupils, of course, having their excursions apart from the seniors. Also, on account of the large number and the difficulty of movement in the narrow, rock-strewn canyon, the pupils had to be divided into groups, as it was not possible for a large number to see properly in a small space. It was hence impossible for me to do the whole of the teaching myself. It was arranged that the school staff should accompany the excursion, and that geologists, and those interested in nature should be requested to assist by taking charge of the ten stations previously selected (as explained later).

Dr. Smyth, the lecturer, and the students of the Training College were then invited. It was arranged that Inspector Dean, several teachers, and a party of pupils from Ballarat should join us at Bacchus Marsh; and that a small party of pupils from the Burnley Horticultural Gardens, with their teacher, Mr. A. G. Campbell, should also accompany us. Many metropolitan teachers, as well as several parents and friends, brought the party to the large number of 550.

By special arrangement, the train stopped on reaching the top of the plateau after its long climb up the great horse-shoe bend. Bacchus Marsh station is 343 feet above sea-level. Where the party detrained was 1,180 feet above sea-level. Work began immediately the empty train moved off. The substance of the four lessons on the plateau is included in the following notes.

On looking around, it was seen that the party was on a very level,

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but narrow tract of volcanic country—a lava plateau, the long lava flow from Mount Ingliston. In front lay the Werribee Gorge, behind was the Parwan Gorge.

In rainy weather, the country becomes a sheet of water, which, overflowing, trickles down into the Bacchus Marsh Basin. Thus this area represents a young plain—the streams are narrow and steep-sided, and the water-shed is a swamp. The drainage water has not yet cut even a gutter or any watercourse in the central part of its almost level surface. Being composed of recent volcanic rocks, it is devoid of trees.

A very short walk, and the party stood in amazement as the beautiful view of this wild gorge burst on them. Below, far below, was the river. What a change from the dead level just behind us! A few yards up stream, the country was rangy and well timbered with eucalyptus, etc. Here on the plateau, there was no timber; but, on the side of the valley, could be seen trees of great interest. The Murray pine flourishes in this sheltered spot. It is not found south of the Divide at many other places. Also, in this same district, within a few miles, is a patch of wild mallee scrub. Most things of interest in Victoria seem to be represented at Bacchus Marsh.

A move to a prominent point enabled us to look either up or down the Gorge. Seats were quickly taken just below two she-oaks. This was a natural theatre, the seats consisting of small columns of basalt at the edge of the lava flow. Here the main introductory lesson to the whole party was given by Mr. Leach.

Looking up the Gorge, the hard bed rocks, consisting of very much folded shales and sandstone had withstood the weather, and given steep, almost vertical sides to the canyon. Still further up on the other side could be seen the level basalt (lava) plateau of Myrniong—a plateau similar to the one we were seated on. On the hill almost opposite our point, a small patch of lava could be seen capping the summit of the hill, and preventing its being worn away, since the lava cap is harder than the rocks around and under it.

Straight before us, there was no lava cap. Hence the country was much worn down, and had been dissected into a series of ridges and valleys, and stood at a much lower level. Our side was protected by its lava cap. We were on a young plain. Opposite was an "old plain," and yet both were obviously of the same age; so "old" and "young" as used by geographers are seen to be adjectives of condition. That is, they do not refer to age in years. It is possible to get an "old" plain in soft rock actually younger in years than a "young" plain in hard rock.

The plain opposite had its drainage perfect. Each watershed was a well-marked ridge, and no lake or swamp was on it. On the other hand, the right bank had no definite watershed, and it was a series of pools and small lakes in wet weather—a young plain.

Consider now the volcanic rocks we were on. They reached their present position in a liquid state, flowing here from Mount Ingliston. The question is then: "Why did they not flow on, and fill the deep Werribee Gorge so far below our feet?" Necessarily, that valley was not there at that time. It has been formed since. The query now is, "What formed the gorge?" There is but one answer—the river. The water running down from the plateau from an elevation of over 1,000 feet to the basin beneath acquires great velocity. It rolls and carries great quantities of stone, sand, mud, etc., along with it. You will see some of these rolled stones directly. With these, it files away and wears away its bed, constantly deepening it, until, at length, the bed will acquire a gentle grade downward. Thus the Werribee has worn out the gorge before us, and the Parwan the gorge behind us. Neither stream has yet deepened its bed to the desired grade, so each is, in this locality, doing the first stage of a river's work—deepening its bed. Further down the Werribee has, as you can see, passed that stage.

The little patch of lava seen opposite also adds further evidence that the river has cut this valley since the lava came; for that patch was once continuous with this lava. So was the top of Trig Hill which you see some distance down the valley. The river has cut between these two small portions and the main plateau, and they are left lying out from it. Hence they are called "outliers"—evidence of the former greater extent of the lava plateau.

But the great interest of this famous spot does not lie in the mere fact that it is a river canyon. The cutting down of the river has revealed the rocks beneath. Under the lava is seen a series of sands, clays, and gravels —old lake deposits. At the base of these is, as you can see, a tunnel put in by gold-miners to discover, if possible, an old river valley in the hope of finding gold in it. In many parts of Victoria, miners have discovered, under the lava cappings of the hills, that gold-bearing river gravels exist. The former hills at the side of the old valleys, down which the lava flowed, have been removed as they were softer than the hard "bluestone" (lava). Thus we see a fulfilment of the prophecy that "every valley shall be exalted and every hill shall be brought low." Snowden, the highest mountain in England and Wales, is an old lava flow in an ancient river-valley. So are the Dargo High Plains, Mount Useful, the Kangaroo

Grounds near Eltham, and many other Victorian mountains. All over Victoria, teachers will see lava flows ending suddenly on the side of a valley, and they will know at once that the valley has been formed since the lava came there.

Under our feet at Bacchus Marsh, the old lake deposits rest on a peculiar series of clays and sandstones. In these, in many places, large boulders and angular stones are embedded in the fine clay. Evidently this is not a water deposit, for there is no sorting of the materials. Running water does not leave clay mixed with large boulders. On examining the boulders and stones, grooves and scratches are seen on them, and they are also ground into flat faces or facets. Often the edge bounded by two of these flat faces is keel-like. "Water-worn" stones are not faceted. They are rounded and smoothed, but not grooved or scratched. Thus, some other agent has formed these beds. Ice is the only agent known that could have formed the work represented here.

At first it was thought by some that floating marine ice—icebergs—was responsible, but the floors and sides of the valleys where the ice passed over the old bed rock are grooved, rounded, and deeply scratched, where stones frozen into the bottom of the ice have been dragged across it. The stones are also scratched as they are forced over hard rocks in the floor of the valley. They are often knocked loose, turned over, and again frozen into the bottom of the glaciers, so another side is faceted and scratched. Further, there are no remains of marine organisms, worm tubes, etc., on the boulders, so it is evidently land ice that has performed the work.

As to where the ice came from, we cannot yet speak with certainty. Professor Gregory inclined to view that it came from the Central Divide, and moved south. More evidence on this point is necessary, as the direction of the grooves and scratches point to a probable southern origin. It has been suggested by Mr. C. C. Brittlebank, who has examined these deposits very carefully, and has collected a mass of evidence, that the glaciers probably originated in the old land to the south of Western Victoria which has disappeared, for, in those days, and long afterwards, Australia was much more extensive than at present. This is shown by the fact, amongst many others, all pointing in the same direction, that the little minnow or mountain trout sporting in the waters below is also found in the streams of South America. It is a fresh-water fish and does not go to sea. Also, the marsupials so common once about here, the 'possums found in those trees, the kangaroos, and bandicoots find, in South America, their nearest relations outside the Australian region. The evidence of lampreys, earthworms, frogs, etc., all point to an extension of Australia to the south. Evidence of other extensions will be given directly.

Interesting as it is to find evidence of glaciers in a country now quite free from permanent ice, it is the particular age of these rocks that lends such great interest to their presence. Of course, it is not possible to fix their age in years; but they were formed in the "dim distant past." Fortunately, there is conclusive evidence as to the period in which they were formed.

From where we are seated, you can see that rounded green hill, three or four miles away. It has a quarry on the side of it. In this quarry, in a fresh-water sandstone which is used for building stone (the old Treasury in Melbourne is built of stone from that hill) are found the impressions left by a fern-like plant *Gangamopteris* (Gr. *pteris,* a fern). These sandstone beds rest on the glacial rocks, and so are younger. The same fossils are found in New South Wales in rocks resting on beds of coal. Coal is also found above these fossil-bearing rocks. Hence this fossil belongs to the coal period. So here in Victoria, since we find glacial deposits below the fossil-bearing rocks and also above them, as Mr. C. C. Brittlebank assures me, these glacial rocks were formed in the coal period. This fossil—the remains of a land plant—is also found in India and in South Africa; so here is some evidence of other extensions of Australia, a north-westerly extension to India, and a westerly one to South Africa.

We have seen that Victoria had glaciers, and in the coal period. Now, to account for the presence of great deposits of coal in many widely-separated countries of the world, and all formed in this one period, some scientists assumed a universal tropical climate—hot and moist, in order to explain the luxuriant vegetable growths necessary for these enormous coal deposits. Bacchus Marsh supplied the death-blow to that theory, as it was the first place in the world where glacial rocks of that age were discovered. Hence, outside Victoria, Bacchus Marsh is a very famous place. Victorians, needless to say, have hardly heard of it. "Distant fields look green," so America is the wonderful country. Fortunately, nature-study is removing that idea.

These glacials are not the oldest rocks found here. The rocks seen in that steep part of the canyon are much older. They form the bed rock of the district. They consist of sands and clays—sediments deposited in the sea, long, long ago, in a very early period of the earth's history. As the earth's centre lost heat and contracted, the crust, being already cold, could not contract; hence the rocks forming the earth's crust must wrinkle. The original horizontal, or almost horizontal, layers of rock—strata—must fold up and down. The up folds—saddles—have the legs sloping against one another, hence they are called anticlines (*anti,* against; *clinos,* a

slope). The down folds have the layers sloping into one another, and are hence called synclines (*syn,* together). The wrinkling, pressing, and twisting has hardened and altered these old sediments, so that the sands have been altered into hard sandstones, and the clays into shales, and even into slates. You have seen some of these wrinkled and altered rocks before; but you will see them up in the canyon part of the gorge again directly.

Just to sum up the history of this spot. First, the old sediments deposited in a sea long, long ago. Then these were folded and wrinkled, when the true fold mountains of Victoria were formed. These were worn down by river action—the action of running water. Then great glaciers covered this part of the country, and left over 1,000 feet vertical thickness of the well-marked glacial drifts in the neighborhood of Bacchus Marsh. They also occurred at Heathcote, in the Loddon Valley, and other places in Victoria. Long periods afterwards, a large lake covered this district, and thick deposits of sand, gravel, etc., were laid down on its floor. Then the lava flows, so common in Victoria (for Victoria is one of the great lava countries of the world), flooded the land, and the flow we are sitting on even kept on down the old cliff face, and reached the basin of Bacchus Marsh. Next, the surface waters flowing from the plateau to the basin worked out the narrow gorge—a work that has not yet been completed.

To connect this romantic spot to our school life, a general view was now taken of the country around. Across the gorge, a little to the west, and some miles away, stands Mount Blackwood, 2,340 feet high. It is a fine volcanic cone, a few miles south of the Main Divide. A few miles along to the east is Mount Bullengarook, a similar volcanic mountain. Next, on the Main Divide is the bold mass of Mount Macedon 3,300 feet, with the Camel's Hump, probably the site of the old vent plugged with harder rock. It is said, by Professor Gregory, to be the base of an old volcano whose lavas, instead of spreading out in thin sheets like the lavas about us, formed an immense dome. The higher and softer parts of this have been removed by weathering until the base or stump of the old volcano has been exposed. Further along are the Hume Ranges, and round to the east is Mount Dandenong, a similar volcanic mass to Mount Macedon. Between us and Mount Dandenong lies the low Melbourne Basin, most of the western half of which is covered by volcanic rocks discharged from numerous volcanoes. Several of these small volcanoes can be seen. Mount Cotteril is the square-topped one on the plain, and Mount Misery is a little north of it; its bare, brown lava-capped top showing distinctly.

That basin from here to Mount Dandenong was the floor of a sea, when the rocks in which we found the fossils at Royal Park, at Keilor, and Beaumaris, were being deposited, and this scarp was the southern coast of Australia. An uplift of the land has caused the sea to retreat, and this district below—a portion of the great valley of Victoria, has become dry land. To the south of us, the You Yangs can be seen—a solitary granitic mass rising from the plain. This mountain was ascended by Flinders, so that he could obtain a view of the country. To the west of that are the Anakies—the Three Sisters—and the Brisbane Ranges. This joins on to the plateau which continues to and beyond Ballarat; while the lava plain, with scarcely a break, sweeps on until it reaches away past Portland.

Several questions were asked and answers suggested.

A move was now made down to the lunch ground in the bottom of the valley, where three coppers, transported by sturdy boys, were already boiling. The steep climb down was safely accomplished.

The hard climbing, the bracing air, and the glorious sunshine had developed a big appetite, so that lunch was vigorously attacked. For the visitors, a hamper had been prepared by the cookery students at the Continuation School, and, to judge from the way in which Cornish pasties, sausage rolls, sandwiches, cakes, etc., disappeared, the work there has reached a high standard of excellence. The lady teachers, prefects, and elder pupils worked with a will, and soon every one was supplied with tea.

The lecturers for the ten carefully selected spots to be examined by the pupils as evidence of the mode of formation and structure of the Gorge and its "storied" rocks were then acquainted with the plan of campaign. Each was to point out the one or two features before him, explain them clearly and definitely, and finish exactly to time. The result was most satisfactory in every case, the attention of the pupils was secured, and highly profitable work done.

At No. 1, Mr. T. S. Hall showed a cliff of typical glacial rocks, contrasted these with water-formed rocks which had been studied elsewhere. The conclusion was irresistible as to the agent of formation—ice, and land ice necessarily. Glaciated stones were picked out of fine clay and examined.

At No. 2, Mr. D. McLennan, State School, Myrniong, dealt with the large boulders rolled down by the stream, contrasting river and glacial stones.

No. 3 enabled Mr. A. O. Thiele, State School, Brighton East, to lead up to the formation of a big gorge from the study of a small lateral tributary.

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At No. 4, Mr. Pritchard, F. G. S., a leading Victorian geologist and palæontologist, showed large boulders of granite embedded in coarse glacial conglomerate (puddingstone). Some of these large boulders were well grooved and scratched. The essentially glacial character of these rocks was emphasized.

At No. 5, Mr. C. C. Brittlebank, who knows this famous gorge from end to end, pointed out the stratified character of some of the glacial drifts. He was also able to show evidence of the probable southern origin of these deposits.

At No. 6, Mr. T. Brittlebank, at the entrance to the canyon proper, showed how its different form was due to the marked difference in the structure of the rocks. The old folded rocks are traversed by well-marked, parallel cracks called joints. The angular blocks of rock break away, giving a very definite and characteristic outline to the gorge. The sides are now no longer sloping, and it is almost impossible to scale them. One face of 615 feet frowns down on the awe-inspired student. Nature is grand here, and man feels his puniness.

At No. 7, Mr. J. W. Gray, Continuation School, showed that the floor of the valley is rounded, grooved, and striated. This is the famous "roche moutonnée," so called because, according to some, the sides of a valley, being rounded, look like sheep's backs (moutons). According to others, moutonnée means "curled," the resemblance being to the rounded curls of a lawyer's wig. Models of this roche moutonnée have been made and sent to different museums. It is a valuable bit of evidence, famous in the scientific world. The pupils are seeing material on which original work has been done.

At No. 8, the valley is wilder still, and the folded rocks are showing the severity of the enormous pressure they were subjected to when the crust of the earth wrinkled. Synclines (downfolds) and anticlines (saddles upfolds) follow one another rapidly here. A tributary creek falls into the main gorge over a fine example of a syncline, the gently-curved (concave) stratum of much hardened sandstone forming the creek bed. A few yards below this, the thick glacial deposits rest upon the side as well as on the floor of the ancient valley in which they were formed. Mr. R. Lidgett, a well-known local naturalist was in charge of this spot.

At No. 9, Mr. Oliver Gray, mining geologist, from Wedderburn, pointed out a well-marked anticline, where the rocks had been strongly cleaved to form slate, due to the enormous lateral pressure. The almost vertical joints (the big parallel cracks) can be clearly seen, which also shows the planes of slaty cleavage at right angles to the joint planes, and

across the divergent strata. These rocks would split into slates—the planes along which they would split are not the planes of the original bedding, but they are formed later by the great pressure.

No. 10 can be seen indistinctly in the centre of the same view. The river here rushes through a narrow "gut" in the older much-folded and crumpled rocks, and many of the party stood with one foot on either bank of the river. The water can just be seen rushing out at the foot of the "narrow." Mr. R. W. Armitage, Continuation School, was in charge of this—the furthest spot dealt with. Here also was a fine example of a pot hole worked out by the river in the hard slates by causing stones, etc., to revolve rapidly.

The plan of procedure adopted was that twelve minutes were allowed to a class at each station. On the first signal given by bugle, each class gathered around the class teacher. On the second, they set off for their appointed stations. The next signal set the ten lessons in full swing. At the end of twelve minutes, another signal stopped the work. Classes at stations 5 and 10 turned back to stations 1 and 6, respectively. The other classes moving up one, the lessons went on as before. Another twelve minutes sent the classes again from 5 and 10 back to 1 and 6, and the others moved up one as before.

After five lessons, the lower classes (1-5) changed to the canyon part of the gorge, while the other classes (6-10) went down to stations 1-5. The same programme being repeated, each pupil was able to visit the selected stations. After the ten lessons, the retreat was sounded, and all flocked back to the luncheon ground, where full justice was done to a second hearty meal. Each child had taken two meals and his own mug with him, so that the catering gave no trouble, other than the supplying of tea. Three large coppers were brought by train and carried by the boys down to the river and back up the precipitous scarp. One pair of boys showed particular grit in sticking to their heavy burden after it had rolled them into the river. They carried it right up the bank, and over the plateau to the railway line.

Tea over, the bugle summoned all to gather; and the party was addressed by the Director, Mr. Tate. In a very happy speech, he expressed his pleasure at the great success of the day's outing, thanked Mr. Hocking, Dr. Smyth, Mr. Leach, and the staff of the school for their organization and the work done, and complimented the children on the great interest they had taken, and the fine attention they had paid. He also thanked the gentlemen who had given up the afternoon's enjoyment to take charge of a station, and repeat their interesting lesson. He asked the pupils to

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show their appreciation of the work of these gentlemen by giving three hearty cheers. This they did with great gusto.

Professor Ewart addressed a few well-chosen remarks to the company, eliciting further cheers. With many wild attempts at a real Australian cooey, the party faced the steep scarp that stood grim and seemingly vertical between it and the railway line.

The behavior and steadiness of the pupils elicited remarks of warm approval from the visitors. From the beginning, the behavior on these field lessons, which is but a reflex of the school discipline, has been excellent. It has sometimes happened that I have been alone with about 200 pupils, but they are interested and are out for business, so that it is always a pleasure to take them afield. Of course, more detailed and more thorough work could be done with a smaller number, say, 20 or 25; but, taken even in classes, at least ten visits would be necessary to let all see one locality. Under that plan, it would not be possible for each to get more than two or three lessons a year. It is preferable to let the pupils see a large number of localities and go more often, although they perhaps derive a little less benefit of each single excursion.

THE COUNTRY OF THE YAZOO DELTA. The Yazoo Delta, or "the swamp," as it is often familiarly called, is an important area of Mississippi lying in the northwest part of the state between the Yazoo and Mississippi rivers. It measures about sixty miles east and west at its widest point, and extends north from the junction of these two rivers as far as the boundary of the state. It is part of the flood-plain of the Mississippi, rich with all the deposits brought down by that mighty stream from the lands washed by its upper courses and all its confluents.

The history of the region presents a few interesting points. De Soto in his expedition across the Delta and somwhere within its range beheld the Father of Waters for the first time. Afterward there were further explorations by the French—La Salle, Bienville, and others From 1718 to about 1730, the French maintained a small colony on the Yazoo, cultivating the land with a fair degree of success. The settlement was finally wiped out by a rising of the Natchez Indians. With English occupation in 1763, agriculture was emphasized and the products were rice, sugar, tobacco and cereals. The English introduced cotton also which soon supplanted other products as a staple. The Spaniards effected the conquest of the country at a later date, but it afterward reverted to the English, by whom it was ceded to the United States at the close of the Revolutionary War.

Present interest in the Delta, however, is in its great possibilities for

cotton raising. It has long been known as a fertile area but its development has hardly begun. Under the old system of transportation by water, it was but the fringe of the country bordering on its navigable streams that was successfully cultivated. The Yazoo with its innumerable windings, making sometimes turns of many miles to accomplish one-half the distance, accommodated many plantations. The flatbottomed steamers landed directly at the bank without the need of wharves and received the bales of cotton all ready for shipment. But the great interior lands remained forested and uncleaned until the coming of the railroads which now intersect the Delta at many points.

Wild animals abounded, and even now, deer, bears, panthers, wolves, and deadly snakes are not infrequent. It was in Sunflower County, in this section, that President Roosevelt went to hunt several years ago, though the results of his expedition were such as could hardly prove the truth of these statements. The forests which still cover a large area are composed of a variety of trees—sycamore, ash, elm, hackberry, hickory, and more distinctively, the cypress, tupelo gum, the red and black gums, and the holly. The oaks, of which there are many species, are decorated with clusters of mistletoe; grapevines hang in myriad ropes and tangles; woodbines and other creepers clamber to the tops of the tallest trees, and palmettos give a semi-tropical aspect to the woods. In winter the warm green of the holly is a cheerful note among the neutral tints of the solid, naked forest. In unsuspected places, cypress brakes, or sloughs, intersect the land. These are filled with water for the greater part of the year, but trees grow as closely in them as elsewhere. Here the cypress shows to advantage its curious characteristic known as "knees," a development of the root which rises in dwarf pinnacles above the water; these are grouped about the parent trunk like naked, pigmy children. The cypress has a beauty, too, all its own, in the delicate, fanlike tops which in the winter seem etched against the sky like some rare bit of Japanese workmanship.

The tupelo gum, another commanding tree, has a convoluted base that, reflected in the water, adds to its appearance of size and strength. Perhaps on the edge of the brake may be a thicket of cane, but otherwise the forest is unusually free from undergrowth.

The value of the timber has not yet reached its highest point, but with an increasing scarcity of lumber, the hard woods will prove a source of wealth to the state if properly cared for. The varieties of gum are already in considerable use. The tupelo, or bay poplar, has some commercial value, and the poorer grade of black gum is used for the repair of ox-yokes

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and wagons, and for other purposes that require a strong, non-splitting wood. The better class of the same lumber has become in a measure a substitute for yellow poplar in the making of boxes. Black gum is said to have increased in value over seventy per cent. in three years. The importance of red gum has also greatly increased in the last half dozen years.

The Bureau of Forestry has issued a bulletin of its characteristics and mechanical qualities. The finer grade of this wood, as it takes a stain well, is made into furniture, sewing machine tables, etc., finished in imitation of mahogany, oak, or walnut. The best quality is exported, being known abroad as satin walnut and American mahogany, and is used for interior finish and cabinet work.

The Delta landowner, however, impatient for large returns from cotton, proceeds wastefully to deaden and burn his timber without waiting for its uses to be defined or its value accentuated by the constantly diminishing supply of lumber in the world's markets. Either he deadens the land, and then leases it to a tenant who agrees to clear it in a certain number of years, or he undertakes the whole task himself. The clearing he can do at the rate of from five to ten dollars per acre, according to the season or his supply of labor. Some of the trees are cut down and piled for burning; others are left to be fired as they stand. When the cutting has been accomplished and the underbrush piled, the whole is set afire and left to burn for weeks until it has practically burned itself out. Some of the greener trees, perhaps blackened and charred, remain standing like accusing witnesss of this useless tragedy of the forest.

The rough and unfinished field is now ploughed and planted in corn or cotton the first year, and very succeedeing year the burning is continued until the field becomes entirely cleared. The land is said to produce the finest upland cotton in the country, and its possibilities are two bales to the acre under the best methods and conditions. All the soil is rich although it varies somewhat in grade. Generally speaking, it is divided into two kinds, the loam or "grapevine" soil, and the clay, "gumbo," or "buckshot" soil. The former needs only to be scratched, apparently, to produce abundantly. The latter, of which there is by far the greater area, is heavier, more sticky, and not so unvaried in productive possibility. In dry weather the surface balls up into small masses resembling buckshot, hence its local name. It holds moisture to a great degree and is therefore more useful in a dry season. One of the native farmers asserts that with the most skillful methods of civilization its value is fully equal to that of the loam. He himself produced on such land, without extensive effort, forty

bales to thirty-one acres. Fertilizer is, of course, not necessary and even on plantations which have been farmed under indifferent conditions for fifty years and more, there is little necessity for refreshing the soil.

Labor in the Delta presents some discouraging features. The Negro is the natural laborer, but it is difficult to find him skillful and industrious. Italians have been imported in some localities, but this departure, although it appears to have been for the better, is not yet looked upon with general favor. The Negro drifts from the plantations towards the centers of population which attract him with their apparent possibilities of better living and less work. The little cities, crowded with black people who live under far worse conditions than those which prevail on the plantations, afford breeding places of vice, disease, and general demoralization; nevertheless the laborers on the back plantations are jeered at by their fellows, as "coming out of the jungle" or "living in the wilderness," so that he of the "jungle" easily forgets that he is the better conditioned.

The plantations are worked either on shares or by renting. In either case the Negro is a tenant, living in the cabin provided for him, and working an allotted piece of land. Supplies, during the making of the crop, are furnished him, and cash advanced, especially the Christmas money which is an important feature of the arrangement. At the yearly settlement, which is at the time of marketing of the crop, the tenant receives what is left over after his rent (or share) is paid, and the amount of supplies and cash, plus a per cent, deducted. The charge of from fifteen to twenty-five per cent. is not uncommon. The result, with the improvident Negro, is to keep him in debt to his employer for an indefinite period. This temptation to the employer is no doubt a great one in view of the unstable character of most of the labor. On one plantation where there was a manager from the North, who could not easily give up his notions of justice to the Negro, conditions were at one time particularly discouraging. With a known rule of only ten per cent. on supplies advanced, the personal encouragement to thrift and morality, and the effort to be just and wise in all dealings, this ambitious manager found himself, at the beginning of a new year, with a threatened emigration of almost his entire tenantry. The year had been a very prosperous one and nearly all the hands had cleared themselves of the debts which the manager had assumed when they first came into his employ. He was therefore at this critical time obliged to import new families and assume a whole list of new debts amounting to nearly two thousand dollars. The perplexity now is, whether, when this set of hands shall have "paid out," he must secure still others or take back

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some of the old ones who removed to the twenty-five per cent. plantations and so have themselves in debt again. Indeed, a Negro's debts seem to become as much one of his possessions as anything that he can acquire; wherever he moves he takes with him his family, his bedquilts, his live-stock—if he have any—and his debt! One finds few Negroes on these interior plantations who can read or write. Even the foremost head hand on this particular place, to whose skill and industry much of its success was due, had to have all his accounts with his hands kept by the manager. There are Negro schools, but they are few and contribute little to the welfare of the community.

There are some very large plantations in the Delta. One comprises 17,000 acres, nearly 7,000 of which are under cultivation. Another owner cultivates 12,000 out of an estate of 30,000 acres. Mr. Alfred Holt Stone, whose studies of Negro labor are so well known, has a successful plantation near Greenville, on the Mississippi side of the Delta.—*Southern Workman.*

Fifth Grade Geography in the Horace Mann School.—The aim of this year's work is to emphasize the life side of geography by studying as thoroughly as time will allow the characteristic industries of the different countries, and to give the children a general idea of the larger physical features of Eurasia. After telling the class that Eurasia includes Europe and Asia, they are asked to locate it on the world map, with which they are already familiar.

Size, surface, and drainage are taught from the map with occasional references to the text-book. After naming and locating the waters surrounding Eurasia, the class are asked to compare the coast line of Europe and Asia with that of North America as to length and character, and to express an opinion as to the location and the number of good harbors they would expct to find in Eurasia. The special advantages which Europe has for trading with all the other continents is also brought out.

In previous work the children have used the physical map but little. Some time is taken just here to teach them how to read the surface from the map and to introduce them to the use of Longmans' *Atlas*. The highlands are located, general direction noted, and highest mountains named. The lowland areas are located, and compared in extent with highland areas. It is shown from the map that the rivers of Asia flow to north, east, and south, and that most of them have their sources in the central highlands; that the rivers of Western Europe flow from the Alps in all directions, and those of Eastern Europe from the low hills in Russia.

In the fourth grade the children learned the different heat belts, and the characteristics of each. Therefore they can tell in what heat belts Europe and Asia lie, and the different temperatures one may expect to find in going from north to south.

Rainfall is studied from the rainfall map. Areas of heavy, moderate, and light rainfall are located. The way of measuring rainfall is explained. The average annual rainfall in New York is given in order that comparisons may be made with other cities and countries. The children learn from the map that in the greater part of Europe and Asia the winds blow from the west. As they blow over the Atlantic they gather a great deal of moisture. In consequence Western Europe has an abundance of rain. Farther toward the east in Russia and Asia there is little rainfall, because the winds have lost most of their moisture. By comparing the rainfall map with the physical map, the children find that the heaviest rainfall in Europe is in highland areas, and are then told the effect mountains have on rainfall.

The plants and animals found in different parts of Europe and Asia are studied, using information gathered by children from books, visits to the Bronx and other zoölogical parks, pictures, and personal experiences.

In studying the people we read from text-books and geographical readers the characteristics of the white and yellow races, locate large sections where they are found in each continent, and enumerate the different languages spoken.

Outline maps are used in connection with many of these topics. Important indentations and peninsulas are named, boundaries of different countries indicated, rivers and mountains located, and the distribution of plant and animal life shown.

This concludes the work on Eurasia as a whole. Europe and Asia are now studied by political divisions with special reference to the occupations of the people.

A very brief study is made of the physical features of the United Kingdom, using the map as much as possible. In order that children may locate places more exactly, and because of the comparisons which they are constantly asked to make, they need to know something of latitude and longitude. They are told that the distance north and south of the equator is called latitude, that the circles on the globe parallel to the equator mark the distance from the equator, that all places on the same parallel are equally distant from the equator. This is followed by drill in finding the latitude of important cities in Europe and the United States. The children are not asked to give the exact latitude, but to use the nearest parallel shown on

the map. Facts about longitude are told in much the same way. The object is to give a simple working knowledge of latitude and longitude for this year's study. The reasons for differences of temperature in similar latitudes—as between the British Isles and Labrador—are brought out through class discussion.

The general method used in studying every industry is first to get information as abundant as may be on the product itself—such as the amount produced, the character of the product—and then to find reasons for the existence of that particular industry at that particular place. In taking up agriculture in the United Kingdom, the products are compared with those of Labrador and of our own latitude, bringing out the reasons for the differences in the one case and the similarities in the other. The need of agriculture and the importance of stock-raising can best be shown by having children find out the population of the British Isles, noting especially the population of England, and comparing the figures with those of the United States in connection with the area of each country. This also teaches them how to get information from the tables of areas and populations to which they will often be referred throughout the year.

In studying mining, comparisons are constantly made with the United States, and Great Britain's place among the five leading coal producing countries of the world is given. The number of miners in Great Britain is mentioned to show the extent of the industry, the dependence of one industry upon others, and to emphasize the demand for agricultural products.

The children of the Horace Mann School have traveled a great deal, both in our own country and in Europe, and are therefore able to give considerable information on many topics from personal experience. Often some child can tell of his visit to a coal mine or some factory in a way which proves interesting and instructive to the class.

Considerable time is spent in teaching the manufactures of the British Isles, following pretty closely the topics given in the outline. The children are required to briing to the class as much information as they are able to gather, special topics often being assigned to individual pupils. They are also asked to bring to the classroom whenever they are able articles showing characteristic manufactures. The advantages for manufacturing and the disposal of manufactured goods are brought out chiefly through class discussions. Here, too, the dependence of manufacturing on mining and agriculture is emphasized.

If agriculture, fishing, mining, and manufacturing have been taught

successfully, it will be an easy matter for the class to name the chief exports and imports, and they will be fairly familiar with the different ports and the character of their trade. This topic is largely a review of previous work, as is also the last topic—the people.

In connection with the study of London and of other interesting places in the United Kingdom, much use is made of the lantern and of photographs. Only a few slides are shown at one time, and the children are usually asked to contribute information or interesting incidents from their own experience as the pictures appear on the screen.

While the location of places has been mentioned only incidentally, it is made an important feature of the work. Not only commercial and industrial centers, but places of historical interest and of scenic beauty are located. The children are required to point out these locations on wall maps and to indicate them on blank outline maps until they become perfectly familiar with them. In the United Kingdom, for example, we hold the children responsible for a fairly exact location of the following cities: London, Liverpool, Glasgow, Manchester, and Leeds. An approximate location is required of such towns as Cardiff, Southhampton, Sheffield, Hull, Edinburgh, and Belfast.

Other important countries of Europe and Asia are studied, using the same general plan. Industries are constantly compared with those in the United States and other European and Asiatic countries already considered.

The work of the grade is reviewed at the end of the year from the standpoint of industries. Maps are made showing location of characteristic industries in particular sections of Eurasia, and conditions favorable for that industry in the localities mentioned are discussed.—*Teachers College Record.*

THE KINGSTON EARTHQUAKE. On the afternoon of January 14 Kingston, the capital of Jamaica, a city of about 80,000 inhabitants, was practically destroyed by earthquake and fire. The deaths number over 1,000. There were about 10,000 houses in the city and parish of Kingston, of which about 96 per cent. were wholly or partly of brick. Not one hundred of these buildings was in a habitable condition after the calamity. The comparatively few wooden bridges were mostly mere huts and were not badly injured. The first shock came at 3:30 P. M., and continued only about thirty seconds. Fire followed immediately, and in a few hours the destruction was complete. Within the first week after the calamity about fifteen severe shocks occurred. As the cable lines were damaged the news

could not be sent to America and England for about a day. Only about a fourth of the population, mostly the very poor, remained in the city, camping on the race-course, in the parks, and in other open spaces.

Kingston was close to the seismic focus. The motion for a little over thirty seconds is described as like that felt on a ship in a choppy sea. The movement was chiefly vertical. Objects are described as jumping from the ground, which, if true, shows how violent was the shock. The rails of the street-car routes were twisted, water-supply pipes were damaged, and the sinking of the shore-line showed that the superficial beds, at any rate, underwent important changes of level.

Port Royal, six miles to the south, shared to a great extent in the ruin, but outside a radius of ten to twelve miles from Kingston the loss to property is small. That, in its initial power, the earthquake was inferior to those of Valparaiso and San Francisco is clear from the smallness of the region that was severely disturbed, and also from the comparatively slight disturbances recorded at Shide, Edinburgh, and other far-distant seismic observatories.

Mr. Charles Davison, formerly Secretary of the British Association's Earth Tremors Committee, calls attention in the *London Times* (weekly edition, January 25, 1907) to the fact that the foundation of Kingston consists of beds of sand and gravel, brought down from the northern mountains. It is on ground of this kind that earthquake shocks attain their maximum intensity. At Charleston in 1886, and at San Francisco last year, the greatest damage was done on made land filling up old creeks or low-lying ground. During the Tokio earthquake of 1894 the range and intensity of the disturbance, as measured from seismographic records, were about twice as great on low, soft ground as on the hard chalk rock in the higher part of the city. Mr. Davison adds:

> Almost the whole boundary of the Caribbean Sea is a band in intermittent motion . . . Jamaica is situated in the very position in which great earthquakes are to be expected, in which the ocean-bed shelves with great rapidity, not on one side alone, as in most earthquake-countries, but to the north even more steeply than to the south. San Francisco, Columbia, and Valparaiso are all situated on the margin of a great slope, while near the east coast of Japan lies one of the deepest regions of the globe.

He urges that, if Kingston is rebuilt on its present site, it may again be visited by great earthquakes, and that their effects will be all the more serious on account of the low-lying position of the town and the loose and friable nature of its foundation. There is no other harbor in the island to compare with the extensive haven between Kingston and Port Royal, and the new town will certainly not be far distant from its shores.—*Bulletin American Geographical Society.*